Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

aRA784
F66
c.2

U.S. Department of Agriculture
Agricultural Research Service

Food & Nutrition Research Briefs

April 1997

Weight Training Helps Lift Depression

Older people who want to lift their spirits and get more quality sleep might consider joining the local gym. Regular resistance training significantly reduced depression and improved sleep in mildly to moderately depressed people in their 60's, 70's and 80's.

Half of the 32 volunteers exercised leg, hip and upper torso muscles on pneumatic resistance equipment for 45 minutes three times each week. The other 16—the control group—attended a group health education meeting. Resistance on the exercise equipment was set at 80 percent of the maximum load each volunteer could complete in a single repetition on that day.

At the end the 10-week study, 14 of the 16 exercisers no longer met criteria for depression. Their depression scores improved two to three times above the control group, the researchers reported in the *Journal of Gerontology* (vol. 52A(1): M27-35). Quality of sleep improved in more than one-third of the exercisers compared to none of the control group, they reported in *Sleep* (vol. 20(2): 051-055).

Elders are at high risk for depression. Researchers with ARS and Harvard Medical School wanted an alternative or an adjunct to anti-depressants because they can cause side effects, interact adversely with other medications and increase the risk for falls or delirium. Moreover, they don't counteract frailty or improve mobility and function.

Progressive resistance training, on the other hand, improved the volunteers' strength, vitality, morale and ability to maintain social activities compared to the control group. It also reduced physical pain and emotional stress that would otherwise interfere with normal activities. This is the first controlled study to show that exercise is an effective antidote for depression and poor sleep in older men and women. And it's the first study to show that resistance training can improve sleep in any age group.

For more information, contact Maria A. Fiatarone, (617) 556-3075, Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts, Boston, MA; e-mail: fiatarone_ex@hnrc.tufts.edu

Dieting Can Slow Reaction Time

Cutting calories may inadvertently slow dieters' reaction times. And that effect may continue for weeks after the diet ends, ARS researchers and their British colleagues found. Reaction time lengthened by 11 percent in a group of 14 women volunteers who went on a strict reducing diet. It continued to slow for 3 weeks after the diet ended. The scientists measured reaction times during the 21-week study by determining how long it took the women to hit the space bar on a computer keyboard after a white star appeared on the screen.

Now, the scientists want to find out whether the slowdown lowers dieters' alertness—and thus increases their risk of accidents—or whether the even longer-term diets might increase such risks. The overweight but otherwise healthy volunteers, age 25 to 42, ate only half of the number of calories needed to maintain their beginning weight during 15 weeks of the study. They lost an average of 27 pounds. Their increase in reaction time confirms an earlier finding by the British investigators, who are with the British Biotechnology Sciences Research Council.

Further study could lead to new understanding of how the body uses calories and nutrients for thought and action. Such information could be used by healthcare professionals to improve diet and exercise regimens for overweight Americans.

For more information, contact Mary J. Kretsch, (415) 556-6225, Western Human Nutrition Research Center, San Francisco, CA; e-mail: mkretsch@whnrc.usda.gov

Diets That Deflate High Blood Pressure

People with high blood pressure would benefit from redesigning their diet in addition to avoiding salt. That's the message from the multi-center DASH study recently reported in the *New England Journal of Medicine* (vol. 336(16): 1117-1124). Adding several servings of fruits and vegetables and a few low-fat dairy foods to a reduced-fat diet significantly lowered blood pressure in African-American and Caucasian men and women.

Look for us on the Web: www.nal.usda.gov/fnic/usda/fnrb

ARS dieticians helped design the menus used to feed nearly 460 volunteers at four centers around the country. They also prepared all meals for The Johns Hopkins University in Baltimore. One third of the volunteers got a "typical" U.S. diet—low in fruits, vegetables and dairy products, with 37 percent of calories from fat. This group served as controls. Another third ate the same amount of fat but with eight to 10 servings of fruits and vegetables daily. The third group got a low-fat diet with the extra fruits and vegetables plus three servings of dairy products. This combination diet had 27 percent of calories as fat with only 6 percent saturated fat.

After eight weeks on this combination diet, systolic pressure dropped an average 11.4 points and diastolic pressure was down 5.5 points in the volunteers with high blood pressure. That's about what can be achieved with a single medication. The average drop for all participants, including those with normal blood pressure, was also significant—5.5 and 3 points, respectively.

The combination menu was designed to increase intakes of fiber and three minerals important for blood pressure regulation—potassium, magnesium and calcium. Bananas, dried fruits and melon pieces, for instance, supplied extra potassium, which totaled 4,700 milligrams daily. Spinach, dried fruits, broccoli and scallions helped raise the magnesium intake to 500 mg. daily. And low-fat dairy products brought calcium intake up to 1,200 mg. Fiber intake was 30 grams daily. Salt was held at 3,000 mg. for all diets. Menus for all three diets are posted on the Web at: http://dash.bwh.harvard.edu.

For more information, contact Priscilla D. Steele, (210) 402-0030, retired from the Beltsville Human Nutrition Research Center, Beltsville, MD; or Lawrence J. Appel, Johns Hopkins University School of Medicine, Baltimore, MD; e-mail: lappel@phnet.sph.jhu.edu

Berry Good Food for the Brain

Diets high in antioxidant foods appear to protect the brain against oxidative damage, if rat studies by ARS and University of Denver scientists are any indication. Oxidative damage is thought to lead to age-related disfunctions such as loss of memory or motor coordination. But rats that ate extracts of strawberries, blueberries or spinach as part of their daily diet fared far better on brain cell function tests than the animals getting chow alone. The fruit and vegetable extracts offered at least as much protection as vitamin E against oxidative damage induced by exposure to a high-oxygen atmosphere.

Earlier, these foods scored highest among commonly eaten fruits and vegetables in a test-tube-type assay of total antioxidant capacity. The next step was to assess their protective power in animals. So the scientists added either strawberry extract, vitamin E or nothing to the rats' normal diet for eight weeks. Then they put the animals in chambers under 100 percent oxygen for two days. They later repeated the study using blueberry and spinach extracts.

High oxygen exposure alters brain function in young rats in a manner similar to the aging process. In both cases, brain cells are less sensitive to neurotransmitters, such as dopamine or norepinephrine, that prompt them to send or stop sending information.

The scientists measured the rats' response to three different types of brain function controlling memory, movement and growth of nerve cells. In all three cases, decline in these functions due to oxygen exposure was significantly—often dramatically—reduced by strawberry extract as well as by vitamin E. Preliminary data indicate that blueberry extract provides even more protection to rats' brains. If this finding holds up, it supports the usefulness of the chemical assay—known as ORAC—for identifying health-promoting foods because blueberries had the highest antioxidant capacity of the fruits and vegetables tested.

For more information, contact James A. Joseph, (617) 556-3178, Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts, Boston, MA; e-mail: joseph_ne@hnrc.tufts.edu

Too Little Magnesium Makes Work Harder

Older people whose heart rate soars and energy dives during aerobic exercise may want to take a closer look at their magnesium intake. That's the message from the first study to look at the effect of low magnesium intakes on the physiological function of people over age 55. A group of post-menopausal women experienced a significant drop in their work efficiency when their magnesium intake was reduced to a little more than half of the Recommended Dietary Allowance for three months. That occurred even though blood magnesium levels showed no sign of deficiency.

During the study, the low-magnesium diet affected the women's physiological function in three ways as they cycled on an ergometer. First, they spent 10 to 15 percent more energy, as indicated by a rise in oxygen consumption, compared to when they were getting ample magnesium. Second, their heart rate increased about 10 beats a minute. And third, the amount of magnesium stored in their muscle tissue dropped measurably.

According to the latest USDA nationwide food consumption survey, fewer than one-third of people over age 50 consume the recommended amount of magnesium through their diet. But it's easy to get enough magnesium to prevent these symptoms in a low-fat diet. Eat more vegetables, especially dark leafy greens, more whole wheat and other whole grain breads, cereals and pastas and more dried beans.

For more information, contact Henry C. Lukaski, (701) 795-8353, Grand Forks Human Nutrition Research Center, Grand Forks, ND;
email: hlukaski@gfhnrc.ars.usda.gov

BMR Estimates Too High for Black Girls

The equations used to estimate the number of calories adolescent females burn while resting are inaccurate for African Americans. That's what researchers found when they carefully measured the basal metabolic rate (BMR) of 76 white females and 42 black females between 8 and 17 years old. The finding is important because BMR accounts for between 50 and 70 percent of the calories we burn daily. Clinicians routinely use BMR to estimate the energy needs of patients. Government agencies use it to recommend calorie intakes.

The researchers had suspected that the current equations do not reflect the energy needs of children and adolescents, particularly non-white youths, because they were derived from measurements done mostly on white adults. What's more, most of the measurements were done during the first half of the century when equipment and methods were less sophisticated.

Based on the new measurments, nine of the 10 equations they evaluated significantly overestimated BMR in the black girls, and half overestimated BMR in the white girls. The ethnic differences became obvious when the two groups were matched for age, weight and sexual maturity. In six of the 10 equations, the overestimation was significantly greater for the black girls—averaging 77 calories daily—than for the white girls—averaging 25 calories daily.

The black girls were heavier, had a higher body mass index than the white girls of the same age and were more sexually mature—a factor that increases overestimation, the scientists found. They reported their findings in the *Journal of Applied Physiology* (vol. 81(6): 2407-2414). Their conclusion: Ethnicity should be included in future measurements of basal metabolic rate and in refining equations used to estimate it.

For more information, contact William W. Wong, (713) 798-7168, Children's Nutrition Research Center, Houston, TX; e-mail: wwong@bcm.tmc.edu

Snap Beans Fingered as Mineral Source

Girls and boys absorb two important bone-building minerals—calcium and magnesium—from snap beans as easily as they absorb them from milk. What's more, there's good potential for increasing the calcium in snap beans through breeding. That's good news to ARS-funded researchers looking for good sources of calcium to replace the 24-35 percent drop in milk consumption among children and teenagers since the late 1970's. Snap beans are a popular vegetable among this age group.

The researchers measured the rate of calcium absorption from milk and compared it with snap beans, broccoli and spinach in 12 girls and boys ages 9 to 14. Although it takes about five cups of cooked snap beans to equal the calcium in one cup of milk, the rate of absorption was the same from both sources. The absorption rate was about 5 percent higher from broccoli, which provides about one quarter as much calcium as an equal amount of milk. But the calcium in spinach was poorly absorbed because of a high content of absorption-blocking compounds known as oxylates.

In tests of magnesium absorption from snap beans and spinach, the youths absorbed the mineral from these two vegetables and milk at about the same rate. Snap beans provide nearly as much magnesium as milk, but spinach provides nearly five times more.

The researchers also collaborated with University of Wisconsin plant breeders to assess 64 unique types of snap beans, looking for differences in calcium content. They found wide differences, indicating that calcium content has a strong genetic basis. This means breeders can develop snap bean varieties with extra calcium. One commercial variety—'Hystyle'—was among those with the highest calcium levels. The researchers also found that younger, skinnier snap beans of any variety had significantly more calcium than older, fatter pods. So look for the "string bean."

For more information, contact Steven Abrams (absorption) or Michael Grusak (breeding), (713) 798-7000, Children's Nutrition Research Center, Houston, TX; e-mail: sabrams@bcm.tmc.edu; mgrusak@bcm.tmc.edu

Streamlined Immune Test May Go Public

A couple drops of blood are all that's needed to accurately assess a person's natural ability to fight off infections or supress cancer, thanks to a new technique developed by an ARS immunologist. It could lead to routine screening of infants and children, the elderly and others whose immune competence may be suspect.

The technique more closely mimics what happens inside the body because it tests the ability of a chemical stimulant or antigen to prompt T cells to multiply in whole blood—a familiar milieu—rather than among foreign proteins now used to culture these lymphocytes. It requires only 0.4 milliliters or less of blood. That's one twenty-fifth of the amount now drawn, making the technique ideal for infants and small children and for people from cultures opposed to giving blood.

Another plus: It's estimated to cost 35 to 40 percent less in equipment and supplies than the current technique. At the same time, it more than triples the number of samples that technicians can handle in one day. And the technicians need far less training to produce accurate readings because there's no need to separate cells from blood plasma or count them under a microscope.

Since 1991, the technique's accuracy has been validated in studies of Chinese populations, screenings of Ranger trainees for the U.S. Army, nutrition studies at ARS centers and in a recent study of normal and HIV-infected infants.

For more information, contact Tim R. Kramer, (301) 504-8396, Beltsville Human Nutrition Research Center, Beltsville, MD; e-mail: kramer@307.usda.gov

A Comeback for the Gooseberry?

A new gooseberry variety named Jahn's Prairie could give most of today's Americans a chance to enjoy this plump, tart, native fruit. Gooseberries are high in vitamin C and are popular in pies and preserves in England. But many wild gooseberry plants in the United States were destroyed decades ago because they can harbor a disease that threatened the pine industry. Jahn's Prairie, which resists the white pine blister rust, was selected from the wild in Alberta, Canada, by ARS researchers. Last year, ARS jointly released the variety with Agriculture and Agri-Food Canada.

The variety could spark new life into a developing commercial gooseberry industry in the United States. The industry was largely abandoned here in the 1940's when a federal law called for eliminating gooseberries and their cousins, currants, because of the rust. The law was repealed in 1966 but some states still prohibit growing the fruits. Gooseberries grow well in the Pacific Northwest, the Midwest, the East and in Canada. The new variety also resists powdery mildew, a fungal disease of the leaves, stems and berries.

For more information, contact Kim E. Hummer, (541) 750-8712, National Clonal Germplasm Repository, Corvallis, OR; e-mail: hummerk@bcc.orst.edu

Better Test To Ensure Safe Goat's Milk

A faster, more accurate test to detect *Brucella melitensis* bacterium in unpasteurized goat's milk and cheese can help prevent undulant fever in humans. Most food borne cases of undulant fever come from unpasteurized goat's milk and cheese from Mexico. The disease can cause chills, fever, fatigue and an aching similar to arthritis. A biotechnology technique called polymerase chain reaction (PCR) cuts the test's identification time in food samples from weeks to a single day. Quick identification is critical so contaminated foods can be removed from grocery stores. About two-thirds of all U.S. cases of undulant fever are attributed to infection with *B. melitensis*.

For more information, contact Betsy J. Bricker, (515) 239-8310, National Animal Disease Center, Ames, IA; e-mail: bbricker@nadc.ars.usda.gov

The U.S. Department of Agriculture prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-2791. To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, DC 20250, or call the phone number listed above.

Peas Have "The Right Stuff"

Pea fiber has solved the problem of producing a high-energy beef snack to sustain military troops during times of great physical stress, such as combat or field maneuvers. While a low-fat diet is normally recommended, the ideal snack for high-demand physical activity would contain 40 percent fat for plenty of energy, plus 30 percent carbohydrates, 25 percent protein and 5 percent moisture. However, the high temperatures needed to make this product also melt away the fat.

ARS scientists found that by adding pea fiber—the stuff that gives pea soup its body—meat retains almost all of the fat during heating without affecting flavor. This fat-holding capability of pea fiber could prove useful in low-fat foods. That's because fat degrades over time, and any loss of fat in low-fat foods could mean loss of flavor.

For more information, contact Brad Berry, (301) 504-8994, Meat Science Research Laboratory, Beltsville, MD; e-mail: bberry@ggpl.arsusda.gov

Fruit Pests Perish With Less Irradiation

Irradiation could become more practical as a quarantine treatment to prevent fruit flies from spreading via shipments of grapefruit and other produce. Studies suggest that it may be possible to reduce by half or more the very low levels of gamma ray energy now used to interrupt insects' development. If confirmed by further research, irradiation could be done more quickly and on fruits that can be damaged by the gamma ray doses now used. Lowering the dose would make irradiation more feasible as an alternative to fumigation by methyl bromide, scheduled to be phased out by 2001.

For two years, Hawaiian papayas and other tropical fruits have been approved for shipping to the Chicago area. Exposure to 250 Grays (Gy) of gamma rays ensures that no oriental or Mediterranean fruit flies hidden inside the fruit will survive to adulthood. But the irradiation amount needed to obtain this exposure level could damage orange, mango, grape, avocado and other fruits in a commercial shipment. ARS tests with a few thousand grapefruit indicate 50 Gy may be adequate to halt Mexican fruit flies hiding inside the fruit.

For more information, contact Guy J. Hallman or Donald B. Thomas, (210) 565-2647, Subtropical Agricultural Research Laboratory, Weslaco, TX; e-mail: hallman@pop.tamu.edu; thomas@rsru2.tamu.edu

The **Research Briefs** is published quarterly by ARS Information. For further information or addition to the mailing list, contact Judy McBride, nutrition editor, at (301) 344-2861; by e-mail at jmcbride@asrr.arsusda.gov; or write her at 6303 Ivy Lane, 4th Floor, Greenbelt, MD 20770.